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ESTABLISHMENT
of the
PULP AND PAPER
INDUSTRY
in the
FLATHEAD REGION
of
MONTANA

Issued by:

The District Forester,
U. S. Forest Service
Missoula, Montana

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GENERAL STATEMENT.

In Northwestern Montana, immediately West of the Glacier National Park, there is a National Forest region that is rich in its possibilities for the successful establishment of the pulp and paper industry.

Rough surveys recently made by the United States Forest Service indicate that there is in this region a compact body of timber containing approximately 1,750 million feet B. M., 75% of which consists of desirable pulp wood species. The composition of the stand is about as follows:

Englemann Spruce.....	60%
Alpine Fir.....	10%
Lodgepole Pine.....	5%
Larch and Douglas Fir.....	24%
White Pine.....	1%
	<hr/>
	100%

Within this area, a unit has been blocked out, with the intention of putting it on the market, providing sufficient interest is manifest to warrant such procedure. For convenience in referring to the map, this area will be called Block 1. (Map attached.)

BLOCK 1.

All of this unit has been covered by extensive surveys and 70% has been covered intensively. The following tabulation gives the estimated amounts of timber by species and drainage:

DRAINAGE	White Pine	Pulp Species Spruce Alpine Fir & Lodgepole	Larch and Douglas	Acreage
Deep Creek	7,055	14,800	21,010	3,500
Canyon Creek	32,800	98,820	14,890	8,300
Big Creek	6,000	230,000	114,000	23,000
TOTAL	45,855	343,620	149,900	34,800
Ownership			95.1	
Gov't.	96.4	84	98.1	
%				
Private	3.6	16	1.9	

* Lodgepole Pine amounts to 15,000 M. Feet.

In addition to the timber it is proposed to sell (Block 1) there are two other large units adjoining which have an important bearing on the proposed project. These units will be referred to as Blocks 2 and 3.

BLOCK 2.

As indicated on the map, this unit lies between the Great Northern R. R. and the National Forest boundary. The timber is all privately owned; the pulpwood material can probably be purchased on reasonable terms. The area is very accessible. Many residents in and adjacent to the block would undoubtedly be glad to contract the getting out of pulpwood.

The area is roughly estimated to contain 150,000 M. feet B. M.; two-thirds of which is suitable for pulpwood. Due to its accessibility, this unit would naturally be a part of the initial operation in conjunction with Block 1.

BLOCK 3.

To the North of Block 1 there is a continuous belt of timber to the Canadian line, 95% of which is Government owned, containing approximately one billion feet. As in Blocks 1 and 2, the composition of the stand runs

largely to pulpwood species, Englemann spruce predominating. This supply of timber would be directly tributary to a plant established for the operation of Block 1, and would constitute a reserve supply for the future needs of the plant subject to local demands which cannot be met from other timber supplies and successful competition for it at the time it is offered for sale.

OTHER PULP-WOOD AREAS.

No other section of Montana affords a greater percentage of spruce pulp-wood in a compact body than the region covered by Blocks 1, 2, and 3 above. However, it will be noticed by referring to the general map accompanying this prospectus, several other large pulpwood areas exist. As a matter of fact, throughout the entire Flathead River watershed more or less pulpwood material is to be found. These areas, although scattered and less desirable, are nevertheless important sources of pulpwood material which will supplement the supply shown in the three blocks.

OWNERSHIP OF PULPWOOD.

About 60 per cent of the standing timber commonly considered suitable for pulpwood and two-thirds of the spruce timber in Northern Montana is included in National Forests and is owned by the Federal Government. The Blackfeet and Flathead National Forests are estimated to contain 1,500 million feet B. M. of Spruce, about 1,000 feet B. M. of Lodgepole Pine, and 500 million feet B. M. of other pulp species, making a total of 3,000 million feet B. M. of pulpwood. On the basis of 75 per cent mechanical pulp and 25 per cent chemical pulp 3,000 M. board feet is equivalent to 3,750,000 tons of

pulp or enough to last a 100-ton plant 125 years from the supply on the two National Forests alone.

These figures are given merely to indicate the pulp resources of the region. A pulp and paper plant, if established, would, of course, have to compete with other wood using industries in the region for raw material.

MANAGEMENT OF TIMBER RESOURCES.

In 125 years a new stand planted or established by natural production will reach saw log size and will be ready to cut. The Forest Service is practicing forestry on the basis of sustained yield. The growing stock and the growth will be carefully calculated and new stands established as rapidly as the old ones are removed. Under this system of management, the productive capacity of the forest will be increased rather than be reduced. This is the experience in all European countries where forestry has been practiced. The capacity of the forests to produce timber permanently will be the limit placed upon wood using industries dependent upon the National Forests. This is the assurance given to industries dependent upon the Forest Service for raw materials—the cut will be limited to the sustained yield of the forests and a constant annual supply of timber will be assured so far as this is humanly possible. Systematic fire protection is in force so that loss from this source is constantly decreasing.

PHYSICAL DESCRIPTION OF PULPWOOD REGION LOCATION.

The area under consideration is bounded on the North by Canada, on the East by the North Fork of the Flathead River and the Glacier National Park, on the South

by the Great Northern Railroad, and on the West by the Whitefish Mountain range.

TOPOGRAPHY.

The region is mountainous and of moderate relief, sloping from the Whitefish Range eastwardly to the North Fork or the Flathead River. The lowest altitude is on the North Fork of the Flathead River—3500 feet above sea level—while the highest is on the crest of the Whitefish Divide—the average of which is less than 7000 feet above sea level. The Whitefish Range has acted beneficially as a shelter against the prevailing south-westerly winds. This same shelter has been effective in helping to retain the surface moisture so essential to the growth of spruce.

CLIMATE.

There is considerable precipitation in this region. The least fall of snow occurs at the mouth of Big Creek where it falls on an average of one and a half feet. At the heads of the creeks on the Whitefish Range the snowfall ranges from 2 to 12 feet deep. Snow begins to fall usually about November 15 or December 1, and remains until May 30, and often until June 15.

The climate and topography are typically adapted to the growth of Spruce, and only in such extremely dry seasons as 1910 and 1919 are bad forest fires in this section at all probable. The natural protection afforded this region from forest fires is a feature of great importance.

RAW MATERIALS.

Besides the large supply of pulpwood some of the other

raw materials, that are essential ingredients or requisites in pulp and paper making, are available locally.

It is possible to secure sulphur dioxide as a by-product from the smelters located at Great Falls and Anaconda. Whether or not the process is a practicable one remains to be determined.

LIME.

Large quarries of limestone suitable for making sulphite liquor are to be found in the Flathead region, and this material can be readily obtained.

TALC AND CLAY.

No talc, clay or agalite of any kind has ever been developed on a commercial basis, or known to be possible for development in this region, according to the Butte School of Mines. The authorities at this institution believe, however, that it is not improbable that talc or clay deposits of desired quality and kind will be discovered. At present talc and clay are developed principally in the New England states.

SULPHUR.

The sulphur required in the manufacture by the sulphite process would practically all have to be secured from Texas or Louisiana. However, in the sulphur dioxide mentioned above which may be available at the Montana smelters, much of the sulphur problem may be solved.

OTHER MATERIALS.

Other materials: Rosin, starch, glue and dyes, are mostly obtainable from Eastern manufacturers.

WATER SUPPLY.

The all essential, pure, clear water, and plenty of it is readily available in the Flathead Region.

COAL.

The coal supply is abundant. The Wyoming, Montana and Western Canada coal field, lying respectively south, east and north, are very extensive.

Mr. George Otis Smith, Director of the United States Geological Surveys, has compiled figures showing that the production of coal in the Sheridan, Wyoming, field in 1915 was nearly one million tons with an average value at the mines of \$1.13 per ton of 2000 pounds. This is sub-bituminous (black lignite).** The Carbon County fields of Montana had a production in 1915 of 1,172,000 tons with an average value of \$1.82 per ton. This is sub-bituminous rank but of higher grade than the Sheridan coal. The Fernie coal fields in Canada are the nearest point of supply.

There is an undeveloped coal field that appears to be making good showing on the North Fork of the Flathead River, on the area proposed for sale in Block 1.

POWER.

Ample electrical and turbine power is to be found at several points along the Flathead River.

For convenience, the power sites discussed are numbered consecutively from north to south. (See map.)

The ownership of these sites is as follows:

Power Site No. 1—Private, Lots 1 & 2, NW $\frac{1}{4}$ NE $\frac{1}{4}$,

** Mineral Resources of the United States, 1915, U. S. Geological Survey.

Sec. 27, T. 32 N., R. 20 W. Government, Lots 3 & 4, NW $\frac{1}{4}$ NE $\frac{1}{4}$, Sec. 27, T. 32 N., R. 20 W.

Power Site No. 2—Approx. Sec. 2, T. 30 N., R. 19 W., Private.

Power Site No. 3—Private, Mountain States Power Co., partially developed, Sec. 31, T. 27 N., R. 19 W.

Power Site No. 4—Government. Under the jurisdiction of the Department of the Interior. Approx. Sec. 18, T. 22 N., R. 20 W.

Brief descriptions of each site, as made in 1918 by E. W. Kramer of the Forest Service, Hydroelectrical Engineer, follow:

SITE NO. 1.

The North Fork of the Flathead River without storage will develop 7600 horse power, requiring an investment of \$1,000,000, or a cost per horse power of \$145.00. This same site, with the storage or reservoir site above, will develop 30,000 horse power, requiring an investment of \$3,350,000, or a cost of \$111.00 per horse power.

SITE NO. 2.

This site is situated on the main Flathead River. It has an estimated minimum capacity of 12,000 horse power with an additional 8,000 horse power available from 7 to 9 months of the year. Developed for 12,000 horse power the estimated cost of development is \$1,560,000 or about \$130 per horse power.

SITE NO. 3.

The Swan River project will develop 8,000 horse power all the year around and 3,000 additional horse power for four months in the year. A total investment of \$1,300,000 is required, not including the purchase of the original

plant from the Mountain States Power Company at Kalispell, Montana.

SITE NO. 4.

This site is known as the Polson site and is at the outlet of Flathead Lake. It is capable of being developed to a capacity of 125,000 horse power. Will furnish 50,000 horse power with its natural flow.

TRANSPORTATION FACILITIES.

It is assumed that if the pulp and paper industry is established in this region, that the mill will be situated on or in the vicinity of Flathead Lake. With such a location, transportation to market of the manufactured product can be obtained over either the Great Northern or Northern Pacific railroads. Such a location has the further advantage of being the natural terminus of several other large drainages carrying good per centages of pulpwood species.

ROADS.

The region as a whole is very accessible. Referring to the map, it will be seen that Columbia Falls, a town situated on the Great Northern Railway at the Southern extremity of Block 2, is the gateway to this pulpwood region. Good wagon and automobile roads reach the agricultural regions from Columbia Falls Southward to Kalispell and Somers. There is an auto road between Somers and Polson on either side of the Lake. A good auto road extends from Columbia Falls to the Canadian boundary running through the entire eastern edge of the pulpwood area. This road was built by the Federal Government and Flathead County at a cost of approximately \$200,000. From the heart of the pulpwood area

to the north end of Flathead Lake in an air line, the distance is approximately 36 miles.

RAILROADS.

The Great Northern Railway forms the southern boundary of Block 2. The main line, running through Columbia Falls, east and west, taps other pulpwood areas that may be considered more or less accessible to the main line of the Great Northern Railroad. A branch line of the Great Northern extends from Columbia Falls southward a distance of 15 miles to Kalispell, Montana, the county seat of Flathead County. An extension of this branch from Kalispell southward to Somers, a distance of 12 miles, connects with the head of Flathead Lake. Another branch extends from Kalispell westerly to Marion, Montana. This branch taps another large timbered region.

There is no railroad connection between Somers on the north end of the Flathead Lake and Polson on the south end of the Lake. Traffic between these two points is handled by boat. A branch line of the Northern Pacific Railroad extends from Polson to connect with the main line of the Northern Pacific Railroad at Dixon, 30 miles southward.

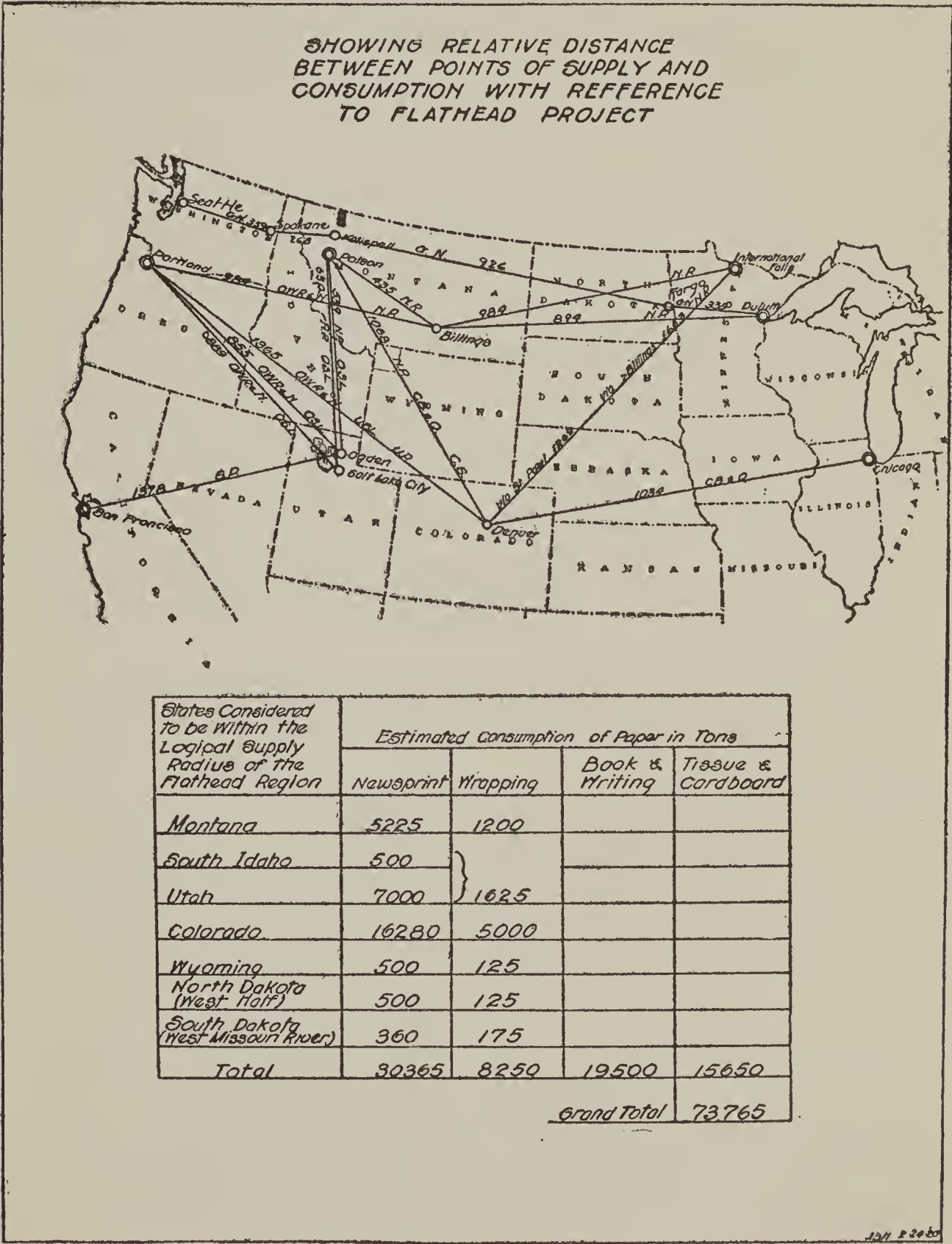
TRANSPORTATION BETWEEN THE WOODS AND THE MILL.

While it is possible for logging railroads to be constructed in the pulpwood region, making connection by rail from the woods to Flathead Lake by a Great Northern Railway branch line, probably the cheapest form of transportation would be fluming logs down the several tributary streams to the North Fork of the Flathead River. This river is a drivable stream and has been used for

many years for that purpose by the various lumber companies of this section. Water transportation is, therefore, very feasible and probably the cheapest form of transportation of the raw material from the woods to the mill.

TRANSPORTATION FROM MILL TO THE MARKETS.

At present the principal markets lie south and south-



easterly. The principal market centers that may be reached are Missoula, Helena, Great Falls, Billings, and Butte, Montana, Pocatello, Idaho, Ogden and Salt Lake, Utah, Deadwood, South Dakota, Laramie, Casper and Granger, Wyoming, Denver, Grand Junction and Pueblo, Colorado. There is no reason why the probable market region might not extend as far south as Galveston, on the Gulf of Mexico. The Northern Pacific Railway would probably constitute the chief distributing line for the product. It connects at Butte, Helena and Billings with other lines.

THE TIMBER PROPOSED FOR SALE.

The timber it is proposed to put on the market (Block 1) lies in a compact body within the drainages of Canyon Creek, Deep Creek and Big Creek, tributaries of the North Fork of the Flathead River. The timbered area forms an unbroken stand from the mouths of the creeks to their heads. The average distance of transportation to the river is, for three drainages: Canyon Creek, 4 miles; Deep Creek, 2 miles; Big Creek, 8 miles. The North Fork of the Flathead River is an excellent stream for driving from its confluence with the above drainage to the main Flathead River. The average distance to Columbia Falls is about 22 miles and to Flathead Lake 60 miles. The chance is easily accessible to either of the above points. There is an excellent road from Columbia Falls to this area.

TIMBER ESTIMATES.

As previously indicated, the three drainages contain approximately 540 million feet, 63% of which is made up of desirable pulp species.

LOGGING CONDITIONS.

Canyon Creek and Deep Creek have been carefully examined and appraised by logging engineers. Big Creek will be so covered in the near future. Big Creek is considered the most difficult area to log, due to the presence of more brush and windfall. On these areas as a whole the ground is unusually firm for the Spruce type. The land is fairly steep and mountainous, although skidding conditions are favorable. The surface generally is smooth. The slope of the side hills varies from 10 to 80 per cent. Fluming is considered the most feasible means of transportation to the river. Conditions are exceptionally favorable for flume construction and operation. There is some question whether there is sufficient water in Deep Creek for a flume operation, but both Canyon and Big Creeks carry ample water for such purposes, except possibly at the heads of some of the branches. It is assumed that at those points the timber will be flumed in the spring during high water or after the fall rains. The size of the timber will require a flume of from 48 to 60 inches.

CHARACTER OF TIMBER.

SPRUCE.

Spruce forms the bulk of the stand and towards the head of the drainage occurs in almost pure stands. It will run 5-7 logs per tree and 7-10 logs per M. As a whole, it is of excellent quality.

LARCH.

Larch is scattered throughout the stand, gradually disappearing as the pure Spruce type is reached. It will run 5-6 logs per tree, 8-10 logs per M.

DOUGLAS FIR.

Douglas Fir is found in mixture with the Larch and does not occur in sufficient amounts to be much of a factor. It will run 4-5 logs per tree, 12-14 logs per M.

WHITE PINE.

In the older stands the White Pine will run 15% to 20% cull. The young stands show very little of defect and will cull not more than 5%. As a whole, the quality of the pine is poor; it has little clear length, and is rough and limby. It will average 5-6 logs per tree, and 8-10 logs per M.

ALPINE FIR.

Alpine Fir occurs in mixture with the Spruce and is always present in that type to a greater or less degree. It is short boled and very limby. It will average 3-5 logs per tree and 14-18 logs per M.

LODGEPOLE PINE.

Lodgepole Pine occurs mostly on the lower portion of the area and is found in pure stand over considerable areas. It will average 3-5 logs per tree, 25-30 logs per M.

SUITABILITY OF LOCAL SPECIES FOR PULP AND PAPER PRODUCTION.*

The practical possibilities of the use of Engelmann Spruce, Alpine Fir and Lodgepole Pine are demonstrated by the commercial production of paper from these species at a mill now operating near Spokane, Washington.

Tests of the pulping qualities of these woods made by

* American Pulpwoods by Otto Kress, S. D. Wells and V. P. Edwards. Reprinted from July 30, 1919 edition of "Paper."

the Forests Products Laboratory at Madison, Wisconsin, show very favorable comparisons with the leading American pulpwoods now being used. As a result of these tests figures have been made available which are indicative of the yields which may be expected. These figures are not offered as conclusive, since they were derived from runs made under very favorable conditions on a laboratory scale, and in commercial practice some deviation from them would naturally be expected. In the expression of the results of the entire series of tests, White Spruce (*Picea canadensis*) was considered standard, and for comparative purposes the results of the tests on this species are, therefore, also given. The yield figures are based on a cord of 100 cubic feet.

WHITE SPRUCE (*Picea-canadensis*).

MECHANICAL PULP:

Yield 2400 pounds. Character, excellent color and strength.

Possible uses—For practically every purpose where groundwood pulp is required.

SULPHITE PULP:

Yield 1030 pounds. Easily bleached. Easily pulped. Excellent color. Excellent strength.

Possible uses—White Spruce is considered the standard sulphite pulpwood and is used for news, wrapping, book, high grade printings, etc.

SULPHATE PULP:

Yield 1150 pounds. Character, very strong fiber.

Possible uses—Highest grade of kraft paper and strong fiber board.

ENGELMANN SPRUCE (*Picea Engelmanni*).

MECHANICAL PULP:

Yield 2100 pounds. Character, strong fiber of good color.

Possible uses—Same as White Spruce.

SULPHITE PULP:

Yield 990 pounds. Easily bleached. A little hard to pulp, excellent strength. Excellent color.

Possible uses—Same as White Spruce.

SULPHATE PULP:

Yield 1000 pounds.

Character and possible uses—Similar to White Spruce.

ALPINE FIR (*Abies lasiocarpa*).

MECHANICAL PULP:

Yield 2070 pounds. Character, white fiber, fair strength.

Possible uses—Same as White Spruce.

SULPHITE PULP:

Yield 1010 pounds. Easily bleached. Easily pulped, good strength, excellent color.

Possible uses—As a substitute for White Spruce.

SULPHATE PULP:

Yield 1050 pounds. Excellent strength.

Possible uses—Same as White Spruce.

LODGEPOLE PINE (*Pinus murrayana*).

MECHANICAL PULP:

Yield 2140 pounds.

Character and uses—A little pitchy but otherwise similar to White Spruce.

SULPHITE PULP:

Yield 1080 pounds. A little hard to bleach. Easily pulped. Excellent strength and color.

Possible uses—As a substitute for White Spruce.

SULPHATE PULP:

Yield 1120 pounds.

Character and uses—Same as White Spruce.

MARKET FOR MATERIAL UNSUITABLE FOR PULP-
WOOD.

From an economic standpoint it would probably be desirable to handle larch and fir in connection with the removal of pulp species. This material could probably be sold in the log to existing mills or it could be cut at a mill established in connection with the paper mill and the lumber sold in the general market. There is also the probability that logs unsuitable for pulp manufacture can be traded to local sawmill operators for pulp logs.

LOGGING COST.

As previously stated, Big Creek has not been appraised. The following is a summary of the estimated logging costs on Canyon Creek, based on average costs in the general region for the years 1917, 1918 and 1919:

Current Improvement.....	\$.90
Additional Improvement.....	.83
Depreciation (Equipment Only).....	.45
Sawing	1.50
Swamping and Skidding.....	3.50
Chuting	1.10
Handling on Scoots.....	.25

Fluming75
Driving	1.00
Maintenance25
Brush Disposal	1.00
Administration75
	<hr/>
	\$12.28

On this estimated cost of logging, an allowance will be made for margin and profit to the operator. Until Big Creek is appraised, it is not possible to fix definite stumpage prices. It can be said roughly that the logging costs on Big Creek will probably exceed the Canyon Creek estimate by 25% and those on Deep Creek will under run them 10%.

The initial stumpage prices will not be less than the following rates and probably will not exceed them greatly, although the rates cannot be definitely fixed until the final appraisal is made.

Green White Pine.....	\$3.50 per M. feet
Dead White Pine.....	1.75 per M. feet
Spruce	1.00 per M. feet
Alpine Fir and Lodgepole Pine	.50 per M. feet
Larch and Douglas Fir.....	1.00 per M. feet

MARKING AND BRUSH DISPOSAL.

The plan of marking the timber to be reserved for seed and further growth will vary with different timber types found. In the Spruce type, the predominant type on the area, the marking will probably consist of group and strip reservations, cutting the rest of the stand clean and disposing of the slash by either piling and burning or broadcast burning, varied as the conditions on the ground warrant.

The other types will be handled as a combination of seed tree and selection cuttings, which will mean the leaving of 2 to 6 scattered trees per acre to furnish seed for restocking the cut over portion or cutting out the ripe timber and leaving enough small material under 12 or 14 inches to form the basis of a second cut. The amount of material so reserved will vary from 10% to 20% of the total volume. The estimates given here are exclusive of these reservations. The brush will be piled and burned and such disposal will be handled by the Forest Service, the purchaser making deposits with the Government to handle such work at such rate per M. as will be determined in the final appraisal.

PERIOD OF CONTRACT.

Contract will run for a period of twenty years, and about 135,000,000 feet will be required to be cut every five-year period during that time.

BOND.

The purchaser will be required to give, as assurance of his faithful performance of contract, a bond in the sum of \$25,000.00.

PRICE ADJUSTMENTS.

In every sale extending over a period of five years, the Forest Service provides in the contract for a readjustment of stumpage prices. This is on the principle that the Government stands all the costs of protecting and growing the timber and assumes most of the risks, and at the same time relieves the purchaser of heavy carrying charges for stumpage; the public is, therefore, entitled to the increase in stumpage value. The reappraisal at the end of the five-year period may or may not show

an increase in stumpage, and in case no increase can be shown, the stumpage rates then in effect will, of course, not be changed. In no case will the price established be less than those fixed originally. This reappraisal will be based on the logging costs of the average operator of that general region, including the operation of the purchaser. The stumpage price will be based on the log market for the various species in so far as a reasonable stable market becomes established. A pulp mill must expect to compete with the sawmills and other wood using industries in the region for wood, and no favors will be shown. On the other hand, the price of stumpage to a pulp mill will not be placed higher than can be obtained for the same class of material for utilization for other purposes. In other words, the stumpage price will be determined on the average value of wood for all uses, and no one industry will be placed at either an advantage or disadvantage, except in so far as natural advantages of utilization may make this necessary.

PAYMENTS FOR STUMPAGE.

Payments will be required in advance of cutting in installments. Such payments are usually made large enough to cover about two months' operation. On this chance the required payment would probably be not less than \$5,000.00, or more than \$10,000.00.

CONTRACT CHANGES.

Government timber sale contracts, while expected to be closely adhered to, are not absolutely immutable. It is to be expected that in long term agreements such as here involved, changes for the mutual benefit of the parties to the agreement will be occasionally found necessary as the work proceeds and unforeseen conditions

arise. As simple procedure is provided for this as is consistent with the protection of public interest.

FINANCIAL SHOWING.

A prospective purchaser will be required to show satisfactory ability to finance the proposed operations before the sale is awarded to him.

ADVERTISEMENT.

As soon as a bona fide desire to buy is indicated by responsible parties the final sale preparations will be completed and the timber advertised. Advertisement will run for a period of from three to six months. This would be sufficient time for prospective purchasers to go carefully over the ground before submitting bids.

FURTHER INFORMATION.

Upon application to the Forest Supervisor at Kalispell, Montana, or to the District Forester at Missoula, Montana, more detailed reports, maps and estimates may be inspected, the complete conditions of sale reviewed, and any other available information obtained.

